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as certain comments on the division and nature of the normative sciences that should be developed, but to enter upon this here would extend this paper unduly, and therefore they must be left until a later date. Our problem was primarily one of the clarification and precision of language, but it is hoped that it has not been wholly unilluminating as to the status of certain facts. Whatever facts may be, this much is certain; it is only through words that they can enter deeply into our thinking and, therefore, the reconsideration of the meaning of words must be the necessary foundation of sound thinking both in philosophy and in science.

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PERCEPTION[1]

WHATEVER perception may be, it is obviously something that has reference to living organisms. It is a term applied to a phase of organic or living behavior. If, then, we first set out the various fundamental types of behavior characteristic of living organisms, we shall be in a position to find a context for the proper study of perception. Observation discovers three basic types of organic action, *viz*, involuntary, reflex, and voluntary. Involuntary and reflex action are different in that the latter occurs only in connection with a disturbance in the organism's environment, whereas the former continues rhythmically (though with variations) under all conditions. They are alike in that they are practically determinate forms of activity which can be almost as easily foretold as sunrise and sunset.

Voluntary action occurs under conditions so variable that it is impossible to foretell what the behavior of the organism will be. It is evident that we are trying to describe voluntary action in terms of observation from without. Is the description adequate? Is it true that it is impossible to foretell the organism's conduct? It is true, but not true enough. Though we can not say what will be the particular act, we can foretell with fair certainty what the eventual consequences of the act will be. It may seem absurd to say that we do not know the act, but do know its consequences, yet this may in a sense be true. We know the general direction, tendency, or end of the organism's activity, but we do not know its means in each instance. Now what is that direction or end? It seems to be incapable of description in terms more explicit than the self-maintenance of the organism and its continuous progress through a process of change. Thus we may speak of the cycle of life of a chicken or a dog as Shakespeare speaks of the stages of man. While we can not say what will be the particular events in the life history of any of these organisms, we feel quite certain that whatever may happen to it, and however much any event may divert its course, the eventual consequence will be the return of the organism to its vital path—otherwise there is disaster and death. Here we come upon the chief differentium of life expressed in terms of objectively observed behavior, *viz,* purposive conduct, where by purpose we mean the maintenance of an uniquely equilibrated activity in a particular direction in time.

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[1] Read at a fortnightly conference of the officers and students of the department of philosophy of Columbia University, on December 1, 1913.

Now we are in a position to ask and perhaps answer some pertinent questions about perception. Had we begun with perception at the outset of this paper, we might have been led, innocently enough, to ask how perception is possible, how it can be valid, what its content must be and whether that content is real or not. By our method of approach we have avoided the pitfalls of artificial problems. We have come upon our difficulty naturally, for we are confronted by a real situation which we are trying to understand and describe. We see living organisms maintaining their characters and pursuing their careers despite many distressing obstacles; we see life existing and operating in the face of innumerable opposing forces. How is this managed? is a problem generated naturally by the situation before us. The answer is that the basic means is the process of perception.

Perception is, then, a process of a living organism that enables it to solve the problems set for it by its environment. It is a process of adjustment to the advantages and disadvantages, values and disvalues of the situation in which the organism fulfills its career. We shall presently discuss the mechanism of perception, for we already understand its function. And the knowledge of its function saves us from the discussion of unreal problems about it. We see that it is a process, an act, and we do not ask questions that would be relevant to knowledge or states of mind or consciousness, but irrelevant to perception as action. Perception is an act of adjustment, and in the sense in which we have defined purpose it is a purposive act. The adjustment is not purely mechanical, for it has reference to past and future time. If I stand erect, and you come behind me and seize my arms and jerk me backward, I fall. Yet this is not adjustment; a dummy used in football practise will do the same. But if you come again when I am in the same position, and hearing your footsteps I turn around to confront you, my act is adjustment. My turning around is not the necessary mechanical consequent of the noise made by your approach. That I do turn around is explicable in terms of the present situation (stimulus), the past (experience), and the future (purpose).

Let us imagine an experiment with two figures, alike in every detail, one of which named M is a machine, while the other named X is a human being. Suppose that the machine is so ingeniously constructed of steel and wax as to be sensitive to light and sound, while Mr. X is uncommonly dull and expressionless. Now let us test them to see which is animate and which inanimate. We flash a light and both close and re-open their eyes. We set off a giant firecracker and both jump as the great noise is heard. We are limiting ourselves, of course, to simple tests in order not to make too great a demand on the mechanician's ingenuity. Must we abandon the experiment and confess our inability to devise a simple test to reveal life as distinguished from a machine? No, for we have as yet failed to take account of the essential factor in living nature, *viz, time.* Let us repeat the loud noise at short intervals. We observe that figure M moves with perfect ease and precision, whereas X is not so certain in movement. One of our observers remarks that figure M which works so smoothly must be alive, for it functions so well, so much better than its neighbor. But we continue to repeat the sound until presently we note that M jumps as unhesitatingly and easily as ever, while X does not move at all.

By this time the result of the experiment is obvious to all, even to him who mistook efficiency for life. We infer correctly that figure M is a machine responding regularly and inevitably in a definite way to a given stimulus, whereas X, who responded in various ways and now does not react at all, is a living being. Now all that we had to connect X with the noise was a process of sensitiveness to sound. There is no knowledge on his part of anything that occurred, for things were so arranged that we could observe him without his observing us. He can not be said to have directed his conduct by any idea, for whatever may be the efficiency of an idea, the conditions for its development were not present.

How then shall we explain his behavior? How does he come to respond variously to the same stimulus? This trait of varied response is the other side of what we noted as the mark of life, *viz,* purpose. Purpose may stand for the end in any segment of the current of living conduct, and variation of response may be regarded as the means. Let us now fit means to end; let us inquire into the mechanism of perception as manifested in our experiment. When the giant firecracker was exploded, air vibrations were set up which pressed against X's body, especially against his ear-drum. The pressure was then transmitted successively to the oval window, lymph, cochlea, hairs, and the fibrils leading to the auditory nerve. The nerves conducted the movement to some center in the spinal cord or the brain, from which center the movement was in turn conducted to certain motor areas such as the leg muscles. The leg muscles contracted and X jumped. There was evidently an inherited structure which permitted an immediate and coordinated response to the noise. But the process we have described is much too simple to account for the act of jumping, for the body needs to be held in a certain way; arms, neck, abdomen, etc., have their part to play in the act. The stimulus coming in by way of the ear must have been discharged to many parts of the body. Nor was the body at rest when the sound was made. Many processes were going on, such as breathing, beating of the heart, gazing around the room aimlessly, which were noticeably affected by the change induced by the sound.

There is obviously no mechanical equivalence between the energy of the sound and the energy expended in the jump. And some have thought this fact of excess of energy in response over stimulus to be the distinguishing trait of organic behavior. But observation of nature reveals similar occurrences in the inorganic world, where by a slight shock nitro-glycerine is decomposed into water, carbonic acid, and nitrogen, the process being accompanied by a powerful evolution of energy. It is true that a slight stimulus will often initiate a great reaction, but there is no miracle in this. It is simply a way of saying that the organism is a storehouse of a large amount of potential energy which will be released whenever necessary by any proper stimulus, however slight. In the case of X we note that the effect of the sound pressing against his ear-drum was to release many tendencies in his body and to disarrange or rearrange its processes.

Now is this perception? Have we explained the situation adequately by describing the physiological structure that connects sound with jumping. Obviously not, for to stop here would be making a mystery of stimulus and response. What is this sound that is said to have made X jump? It did not make us jump even at the beginning of the experiment, and at the end it did not visibly affect him either. Is it not obvious that in perception, at least, the sound made by the explosion of a firecracker is to be judged according to its contextual relations? In a certain sense it was the same sound that we all heard. In the light and fulness of present knowledge (and this changes in the course of time) we can study the sound retrospectively, and then we come to agree that in the context of this knowledge, by means of which it is interpreted, the sound is a definite fact, and the same for all of us. But was it the same for us all when it happened? Experience is insistent on this point, in showing that sounds, smells, tastes, etc., are very different for various persons at various times. Then if X and you and I did not have precisely similar perceptions, what is the cause and mark of difference? Or, to come to closer grip with the problem, what was the difference between his relation to the sound heard first and the sound (agreed by us to be exactly similar) he heard last? The first made him jump, the last made him disgusted. It is clear that we are dealing with relations, the relations of an organism to a series of vibrations. What is this relation? Relations are manifold and it would be useless to go through a list of them to show what this relation is or is not. Let us say directly that this relation is one of *meaning*, a relation peculiar to living organisms in their dealings with their environment. What Mr. X perceived was not so many vibrations of air per second, but the meaning to him of the environmental situation. To him the event meant danger, and as it had meant the same for a long line of ancestors, it had, by the reactions repeatedly called forth, formed a structure or system in his body that enabled him to respond immediately to the stimulus.

Had X's response, the jump, proved satisfactory, we would not have noted in this particular case any change in behavior from rapid movement to none at all. But the jump was not satisfactory, *i. e.*, it was not itself a value, for it did not lead to further responses. If the sound had fulfilled its meaning (say by the presence of a lion), X's jump would have been followed by running or fighting, all in a continuous succession wherein every element has its meaning or value by what precedes and follows it, *i. e.*, by its place in the continuum. But the jump was a disvalue in that it cost valuable energy without becoming a means to further action. The condition of the organism after the jump was one of dissatisfaction. Not that X was not happy to find himself unharmed. But compare his feeling to what it would have been (and was in the case of his ancestors) had the jump led to flight and finally to escape and victory. "Ah," he could say, "that was a fine jump, and didn't I run fast!" How he would have exulted in every precious moment of the hard-fought battle! But here the jump led nowhere. It was like the golden apples that turn to brass in your hand. It cost so much to attain and was worth so little. It was a *means* to nothing and it *meant* nothing.

On its physiological side the situation is probably as follows: The energy released to the motor areas, especially to the leg muscles, is of a quantity large enough to start the full movement, jump—run, etc. But there is a break in the motor phase of the activity. There is no running, or very little of it, and the result is a back-up of energy in opposition to the direction initiated by the sound stimulus. This back-up and the resultant conflict cause a degradation of the system. The structure gets shaky, so to speak, and the next time the sound is heard the paths of discharge that were formerly so free are now somewhat clogged. The sensory situation when the last sound in our experiment is heard, is such that discharge is no longer to the motor areas, but to other centers which *do* lead somewhere, say to esthetic appreciation. We see thus that the air vibrations which first meant danger now mean something totally different. The perceiving process not only relates us to what affects us at the moment, it is not an instantaneous carving up of the environment, or arresting of a limited portion of the surrounding flux. *Perception is a temporal process that opens up new things to stimulate us. It is a progressive discovery of values or revelation of reality.*

We have been considering a situation which, however plausible, is not characteristic of perception, and it may therefore be well to study an example of perception in daily life. Suppose, then, we ask what happens when one sees his friend enter the room. What is the content of the perception,—is it a man one sees or merely a reflection of one's own consciousness? Suppose that as soon as one sees him one goes over and shakes hands with him. Of course no one would claim to be shaking hands with a meaning, and if it is a man one shakes hands with, it must be a man that one saw. Moreover, one could not have gone to greet him without having seen him first; ergo, one saw a man, a physical entity having no smack or taint of meaning about him. Let us test this situation. When the friend stepped in, light reflected from his body, dashed against the eyeball of his host. Now it is imagined by some that at this point in the process of perception an image of some sort is impressed on the retina and is then conveyed somehow to consciousness. But the facts are different, I believe. There is no image in the retina until the light stimulus, having first reached an appropriate brain-center, is discharged back to the eye. The eye must be accommodated for the seeing of the object from which the light stimulus comes, and this accommodation is directed by cortical control. But even when the circuit has been established, there is no sight of a man. At most there is movement of the eyeball. But the man that one sees is tall and solid; he wears a rough cheviot suit and smooth gloves, all of which one sees contemporaneously with the sight of his blue tie and pale cheeks. The roughness and smoothness and solidity are evidently tactual data in perception, and if redischarge were only to the eye there would be no perception of a man at all. However, the organism seems to be wiser than some of its philosophical critics. The incoming charge reaches centers of the spinal cord and brain, and from these centers redischarges are made in various directions, for example, to other centers and to a number of peripheral sense-organs. The call that reaches the organism by way of the eye is communicated to other agents in the communal enterprise of perception. If there is to be any perception at all, it must be accomplished by the cooperation of the various senses and neural centers.

Successful cooperation is dependent upon a proper coordination of the sensory reactions. What are the conditions of this coordination? Simple observations of infants show how coordination has to be *learned.* They kick and fling about and roll their eyes and turn head and body at every stimulation. The frequent presence of the same stimulus results in coordination becoming more easily and rapidly effected, till presently the child perceives immediately—he sees a person completely, at once. But this is at the cost of many previous trials in the course of which the coordination grows better and better. Yet is it proper to regard the coordination as fitted to the act of seeing? Has the child learned laboriously to coordinate merely to see or recognize or know his mother? This is contrary to the facts of life where the organism finds the object of perception a value or disvalue. There is no consummation in seeing. Seeing or perceiving generally is for further action and is conditioned by the history and destiny of the percipient. The perception is conditioned by the quality of the sensory situation *before* and *after* the perception.

So, in the case of the friend whom one sees as he enters the room. In a sense one sees the greeting as much as the friend. For the light stimulation from his body sets up a sensory condition which has its roots in one's previous experience with his friend. There are movements of the eyes and legs; there are neural currents and cross-currents in various directions. What is the quality of these movements and how are they correlated? Is the situation one of conflict and interference or is it one of progressive coordination? Perhaps the conflict of the various elements in the sensory situation is such as to inhibit any response—this means that there is as yet no perception. Perhaps partial responses are being effected, tending to bring about the coordination requisite for a total or complete response. When the coordination occurs, a deed has been accomplished that may be termed variously as perception, or selection of stimulus, or choice of response. In other words, the organism, *disturbed* or threatened or aided by the environment, has restored its equilibrium, has regained the track of its career.

Now we have been trying to show that the sensory situation of conflict or of harmony is not a chance affair. Its conditions may be analyzed and enumerated as (1) organic equilibrium, (2) organic momentum, (3) organic reserve tendencies, (4) the organism's biography or past experience, (5) its purpose. The present sensory situation is a *forecast* of my future movement, for that future movement will be the outgrowth of factors operating in the present situaion. But this situation derives its character from the organism's experience of the *consequences of its previous responses* to disturbances of this sort. Former consequences of organic action have so affected the organism that its present activities have a tendency to attain or avoid certain consequences of its own behavior, or, in other words, to develop certain values by its own conduct. When, therefore, the coordination takes place, the perception on its mental side is a feeling of my present organic attitude, which is what it is because of my experience and my purpose. The perception is thus an *anticipation* as well as a recognition. The friend whom one sees is the friend who was a value or source of happiness yesterday, and who will be the same presently. In seeing him one has a feeling of the outcome of one's present organic attitude, an anticipation of the consequences of his conduct—his developing response to his developing stimulus. Stated differently, perception is a cardinal point in a process of selecting a stimulus and response, neither of which could be chosen separately, and both of which have their mental aspect in a feeling of anticipation.

The organism is constantly gambling with the odds as much in its favor as it can manage. It does not respond without an interest in the outcome of the response as a source of further stimuli to further action. It is always in a situation of stimulus—response—stimulus, a situation which though compelling the organism to react somehow, yet permits it to react intelligently, by affording an opportunity for choice. Perception is a process of choosing, for it is the intermedium between the organism's present stage and the stage which it desires to attain. The organism may experiment with its environment in order to determine the various steps in its forward march. But experiment is too dangerous, if the whole organism is to be risked in testing every situation. Why not develop a mediating process, a sort of buffer, whose function it shall be to experiment with disturbing stimuli, and thus to presage in the presently operating organic situation the quality of the possible consequences of organic action, while these consequences themselves are yet undetermined? Here is opportunity for choice. The organism, having felt the consequences of its conduct, in a part of itself, a part that stands midway between it and its environment, is free to determine what its behavior as a *whole* shall be.

A perception is then definable as a choice of a stimulus and response in view of selected consequences to which they may lead. The friend one sees is the friend one expects to greet, who will greet one warmly, and with whom one will spend a pleasant evening. None of these expectations is necessarily known as such. Here it is important to recall that perception as we have been limiting the use of the term is not a state of mind, or a fact of knowledge, but primarily a fact of organic action. Suppose an indescribably strange creature to enter the room of a person who is resting on a couch. Observe his behavior as soon as his conduct appears to be a function of the strange visitor's presence. Does he remain quite still, does he approach the intruder, or does he flee? We notice that his eyes shut and reopen quickly, his fingers twitch and are clenched into a fist, his limbs shake—in short, he appears in a number of conflicting attitudes of attack and defense. These attitudes have their counterparts in many partial responses that are taking place within his sensory system. Of the many tendencies that are contending for overt execution one becomes dominant and a coordination of the sensory system is effected—now perception takes place. The invader has uttered a loud shrieking sound, and his frightened victim hides under the couch.

When asked later by a friend why he is so cold and pale, he says that he ran away from a ghost or what-not. When his friend suggests that it was a witch he assents; when told that it must have been Mephisto, he says, "Certainly." Then his friend discloses that it was himself playing a trick on him, and when he has regained his composure he says, "Why of course it was you!" and they go over the details of the experience. It is clear that neither friend nor devil entered into the experience when it happened, but it is easily reconstructed retrospectively. What occurred was a feeling of an organic tendency to flee from a presence that had a meaning of dread, an anticipation of harm. Action and perception took place, but there was hardly anything that could be called knowledge.

Now what is the relation of perception to knowledge, on one hand, and to action, on the other? Perception is not a knowing, not an idea; neither is it a complete overt act. Perception is a peculiar kind of action, *viz*, the organism's incipient act, its internal and partial activity leading *to* overt action and to knowledge. We have, of course, been discussing the process of perceiving. If we must employ the word "perception," let us limit its use to designate an organic situation, which on its motor side is a coordination of tendencies into a definite incipient action that is the mean between chosen stimulus and response, and on its mental side a feeling of anticipation of future consequences.

In assigning this definition to the word perception we are not doing violence to language, though we are dealing pretty roughly with "the genteel tradition in philosophy" that set up the elaborate outfit of sensations, images, ideas, states of consciousness, etc., in order to connect two parts of a complex, which are first artificially separated and then miraculously rejoined. In the view that we have been trying to explain the organism and its environment are in continuous and dynamic relation. The attitude of the organism to its surrounding material is fundamentally one of touching, gripping, etc., and is manifested in many forms of various degrees of refinement, such as taste, smell, hearing, and seeing. What better word could be used to denote this attitude or activity than the word "perceive" which originally meant, to seize or hold *through* something, or take possession of a thing thoroughly? The internal activity through which the organism takes thorough possession of its environment, by means of which it discovers the values needed for the fulfilment of its career—there you have perception.

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MISS CALKINS ON IDEALISM AND REALISM[1]

THE controversy between realists and idealists promises to be unending, partly because both parties are guilty of unconscious fallacies in their arguments, which remain undetected by their opponents. I think such a fallacy lies in Miss Calkins's paper, a fallacy which affects the root of the matter (the quotations are abbreviated for convenience).

"The realist" says Miss Calkins "describes an object as yellow. Some one may deny the yellowness. This throws the realist back on what he directly observes, what he knows with certainty—that he is having a complex experience described by the term yellowness" (p. 603).

There is a fallacy here in stating the true position of the realist, and as it is a fallacy often acquiesced in by realists themselves, it may again have escaped detection. The final sentence, so far from being unchallengeable, verges on the absurd. If the original assertion made by the realist be denied, he is undoubtedly thrown back, like every one else, on what he directly observes; that is his final court of appeal. The questions, then, are, What does he observe? Of what is he certain? and no realist can, or should, accept the answer to these questions put into his mouth by Miss Calkins, who says the realist "is having a complex experience described by the term yellowness."

[1] This JOURNAL, Vol. IX., page 603.